

Supplementary Table 1 – Related to Figure 1. Nature and taxonomic distribution of collar cells in Metazoa.

Phylum	Nature of collar cells	References
Porifera/sponges	Choanocytes	(Saville-Kent, 1880)
Ctenophora	<i>None reported</i>	
Placozoa	Ventral epithelial cells	(Smith et al., 2014)AM
Cnidaria	Epidermal cells (putative mechanoreceptors)	(Lyons, 1973a, 1973b)
	Gastrodermal cells	(Kass-Simon and Hufnagel, 1992; Raikova, 1995)
Xenacoelomorpha	Epidermal cells (putative mechanoreceptors)	(Todt and Tyler, 2007)
Chordata	Nephridial cells	(Stach and Eisler, 1998)
	Foregut ectodermal cells	(Milanesi, 1971)
Echinodermata	Epidermal cells	(Nørrevang and Wingstrand, 1970a)
	Coelomic epithelial cells	(Nørrevang and Wingstrand, 1970a)
	Enterocytes	(Martinez et al., 1991)
	Primordial germ cells	(Frick and Ruppert, 1996)
	Epithelial cells of the blastula	(Chakrabarti et al., 1998; Crawford and Campbell, 1993)
Hemichordata	Epidermal cells	(Nørrevang, 1964)
Arthropoda	<i>None reported</i>	
Onychophora	<i>None reported</i>	
Tardigrada	<i>None reported</i>	
Nematoda	<i>None reported</i>	
Nematomorpha	<i>None reported</i>	
Priapulida	Nephridial cells	(Kümmel, 1964)
Kinorhyncha	Nephridial cells	(Kristensen and Hay-Schmidt, 1989)
Nemertea	Epidermal cells	(Cantell et al., 1982; Montalvo et al., 1996)
	Nephridial cells	(Jespersen, 1987)
Annelida	Epidermal cells	(Windoffer and Westheide, 1988)
	Nephridial cells	(Brandenburg and Kümmel, 1961)
Mollusca	Epidermal cells	(Barber and Wright, 1969)
	Nephridial cells	(Brandenburg, 1966)
Ectoprocta	Epidermal cells	(Nielsen and Riisgård, 1998)
Entoprocta	Epidermal cells	(Sensenbaugh, 1987)
	Nephridial cells	(Brandenburg, 1966; Kümmel, 1962)

Phoronida	Epidermal cells Nephridial cells	(Pardos et al., 1991) (Hay-Schmidt, 1987)
Brachiopoda	Epidermal cells	(Lüter, 1996)
Platyhelmintha	Epidermal cells	(Bedini et al., 1975; Ehlers and Ehlers, 1977)
	Nephridial cells	(Rohde, 1991)
Gastrotricha	Epidermal cells Nephridial cells	(Gagné, 1980) (Kieneke et al., 2008)
Gnathostomulida	Epidermal cells	(Rieger and Mainitz, 1977)
	Nephridial cells	(Lammert, 1985)
Rotifera	Nephridial cells	(Mattern and Daniel, 1966)
Chaetognatha	Epidermal cells (mechanoreceptors)	(Bone and Pulsford, 1978; Eakin and Westfall, 1964)

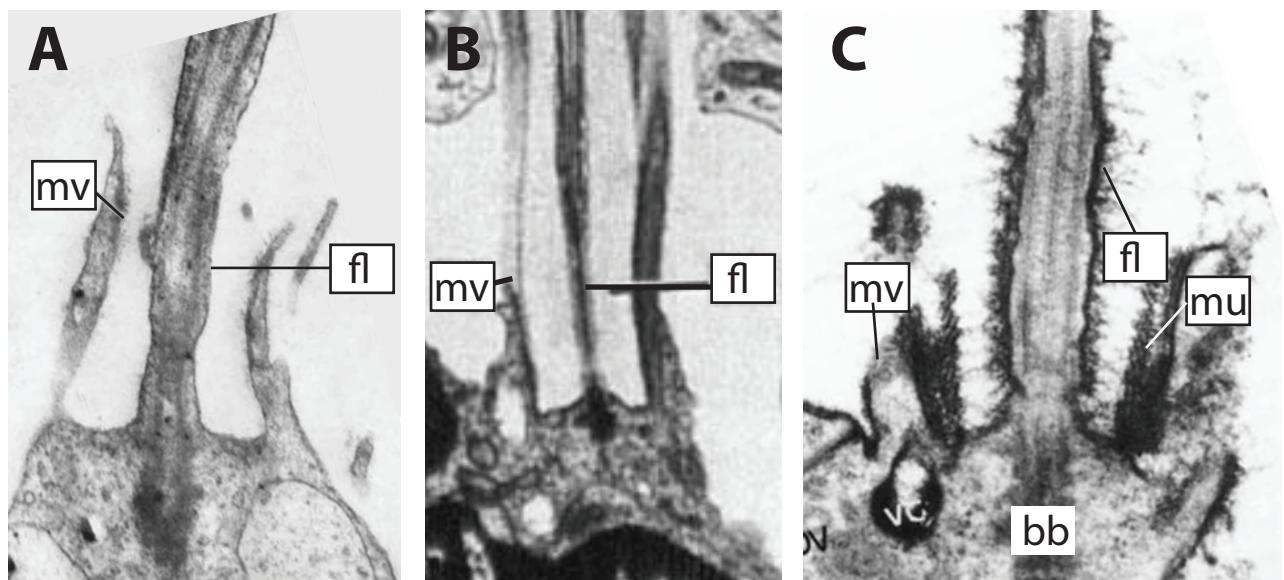
Supplementary Table 2 – Related to Figure 6. Cell modules and their terminal selectors.

Cellular module	Transcription factors	References
Cilia/flagella	FoxJ1, RFX	(Stubbs et al., 2008; Thomas et al., 2010; Vij et al., 2012; Vincensini et al., 2011; Yu et al., 2008)
Contractile fibres	Mef2	(Black and Olson, 1998; Brunet and Arendt, 2016; Brunet et al., 2016; Sebé-Pedrós et al., 2011)
Filopodia	SRF	(Franco et al., 2013; Gervais and Casanova, 2011; Knöll and Nordheim, 2009; Weinl et al., 2013)
Stemness/proliferation	Myc::Max complex	(Young et al., 2011)

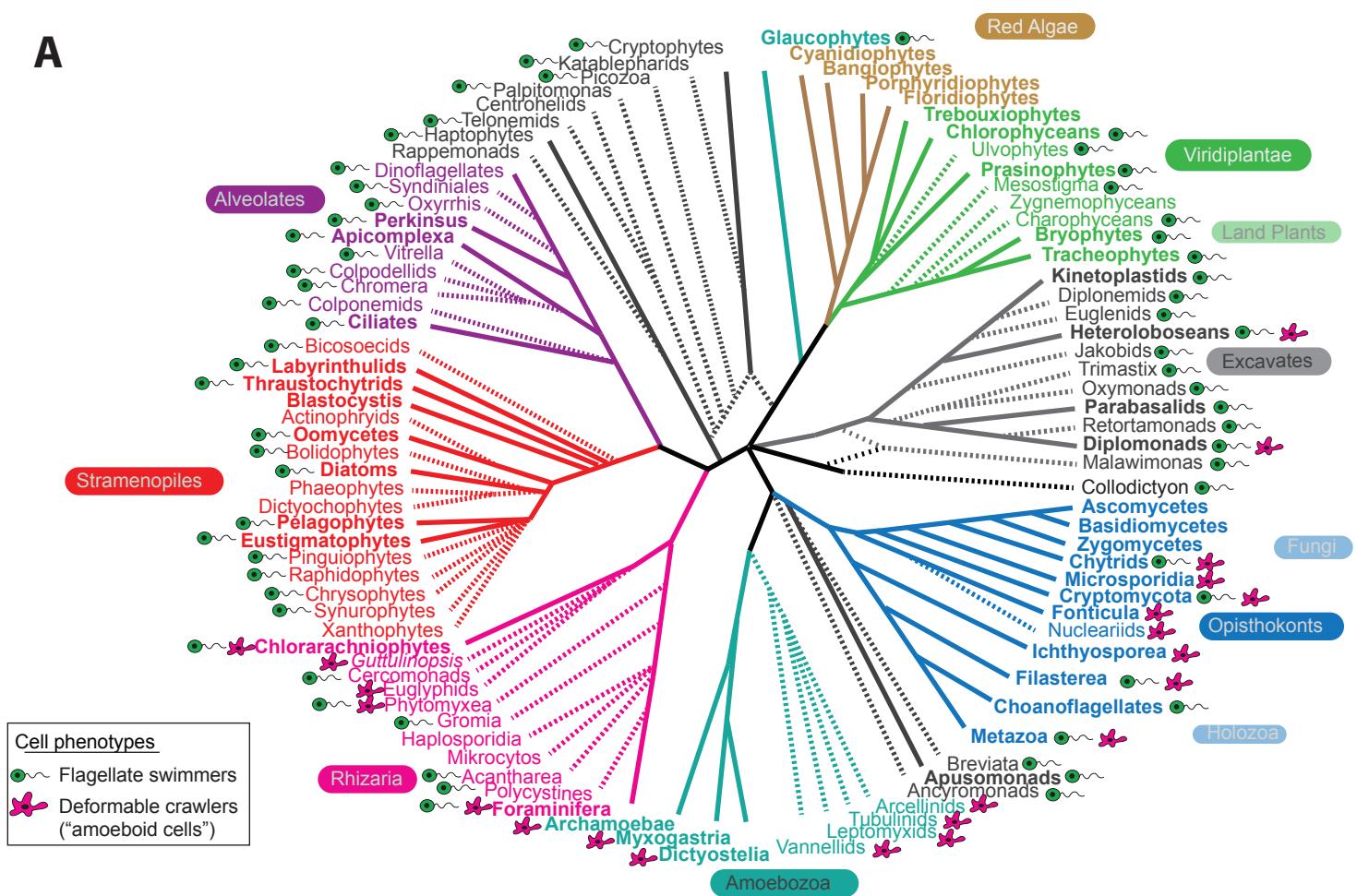
Supplementary Figure 1 - Related to Figure 1. Collar cells of cnidarians and bilaterians. All panels are TEM. (A) Epidermal collar cell from the ciliary bands of the brachiolaria larva of the starfish *Asterina rubens*, from (Nørrevang and Wingstrand, 1970b). (B) Protonephridial terminal cell from the trochophore larva of the annelid *Glycera* (Ruppert and Smith, 1988). (C) Gastrodermal collar cell from the cnidarian *Polypodium hydriforme* (Raikova, 1995). (fl): flagellum, (mv): microvilli, (bb): basal body, (vc): vacuole, (mu): mucus.

Supplementary Figure 2 - Related to Figure 3. Phylogenetic distribution of flagellated swimmers and of deformable crawling (“amoeboid”) cells. Eukaryotic phylogeny is modified from (Keeling et al., 2014). Distribution of crawling cells follows (Fritz-Laylin et al., 2017). Cells with pseudopodia used for prey capture and phagocytosis but not for motility are not classified as deformable crawlers (e.g. choanoflagellates (Leadbeater, 2014), parabasalids (Brugerolle, 2005)).

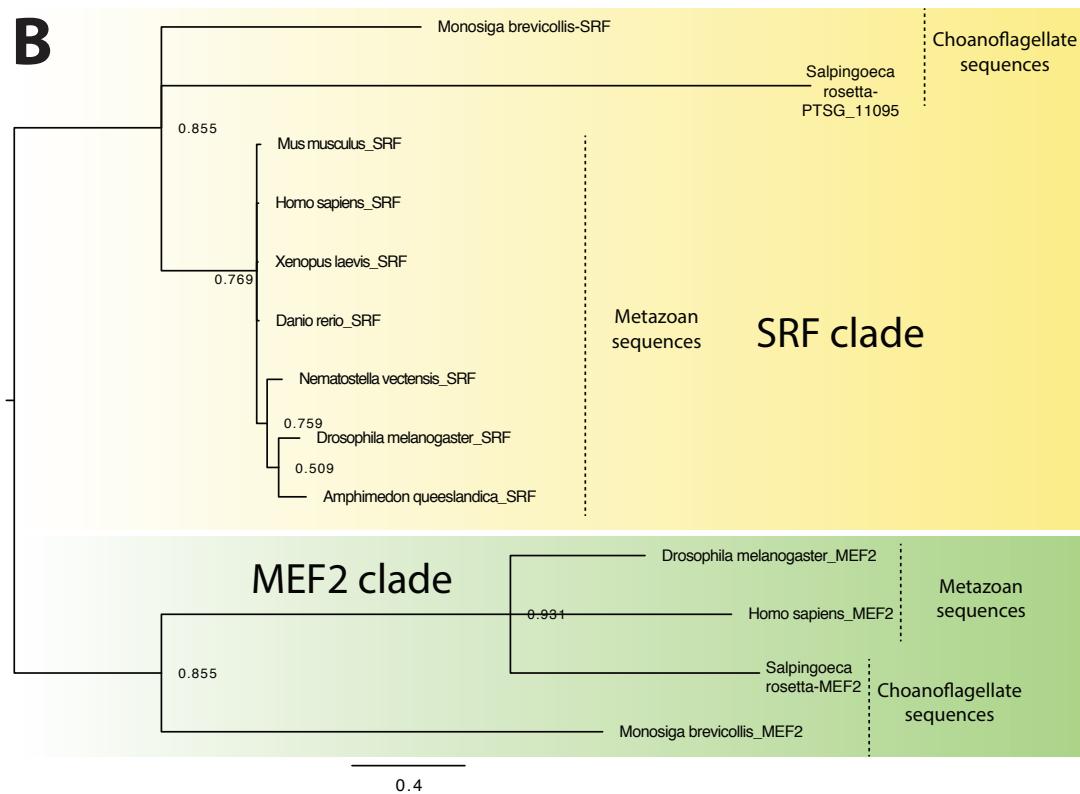
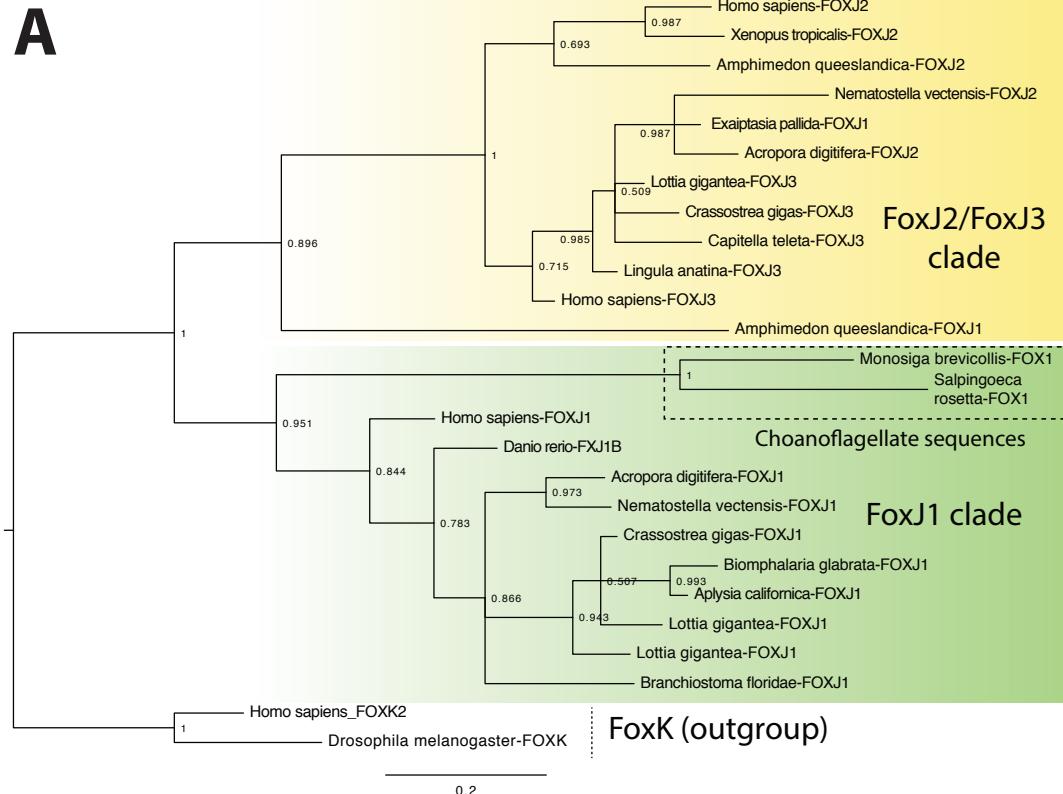
Supplementary Figure 3. SRF and FoxJ phylogenetic trees - Related to Figure 6. (A) FoxJ family phylogenetic tree. The split between the FoxJ1 clade and the FoxJ2/3 clades is inferred to have preceded choanozoans, in accordance with previous reports (Larroux et al., 2008). Two Forkhead-box proteins which are mutual best BLAST hits with *Homo sapiens* FoxJ1 cluster in a clade together with animal FoxJ1. (B) SRF family phylogenetic tree. The tree is rooted with the Mef2 family, the most closely related family of MADS-box transcription factors (including a previously identified ortholog in *Monosiga brevicollis* (Sebé-Pedrós et al., 2011) and a newly predicted ortholog in *Salpingoeca rosetta* on genomic scaffold supercontig 1.36 positions 82482-84459). A *Monosiga brevicollis* predicted protein annotated as SRF and the *Salpingoeca rosetta* protein PTSG_11095 (both mutual best BLAST hits with *Homo sapiens* SRF) cluster in a clade with animal SRF. Both trees have been reconstructed with MrBayes 3.2.3, with 10,000 generations under the GTR substitution model with default assumptions and convergence assessed by standard deviation < 0.01. Support values are displayed on nodes.



Supplementary Figure 1
Related to Figure 1

A

Supplementary Figure 2
Related to Figure 3



Supplementary Figure 3
Related to Figure 6

Supplementary references (Table 1 and Table 2)

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